

**REMARKS**

Preliminarily, Applicants respectfully request the Examiner to acknowledge receipt of the certified copy of the priority document filed July 31, 2001.

Claims 1 and 8 have been amended to recite that at least a portion of the igniter facing the spark discharge gap is free from a material of the at least one of the center electrode and the ground electrode. Support is found, for example, at page 3, lines 28-31 of the specification: ("The igniter under the present invention is a portion (of the welded chip) that is not influenced by a composition change. More specifically, the igniter under the present invention is distinguished from the other portion (of the welded chip) that is alloyed, through the welding, with a material of a ground electrode or a center electrode."). That is, at least a portion of the igniter facing the spark discharge gap is not alloyed with a material of the central electrode or the ground electrode.

Claim 8 has also been amended to recite that the metallic material of the igniter comprises a crystal grain of more than 50  $\mu\text{m}$  in a mean diameter. The lower limit of 50  $\mu\text{m}$  as described in the specification supports the claimed range of more than 50  $\mu\text{m}$ . Support for new claim 21 (crystal grain of not less than 53  $\mu\text{m}$  in a mean diameter) is supported by Sample No. 2 in Table 1 at page 13 of the specification.

New claims 20 and 22 find support by reference to Fig. 2, showing weldments  $W_1$  and  $W_2$ .

Non-elected claims 16-19 have been canceled without prejudice.

New claims 23 to 26 contain all of the limitations of product claim 8. If product claim 8 (spark plug) is found to be allowable, then Applicants respectfully request rejoinder of method claims 23 to 26 pursuant to MPEP §821.04 (process claims which depend from or otherwise

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include all the limitations of the patentable product will be entered as a matter of right if the Amendment is presented prior to final rejection or allowance).

Entry of the amendments is respectfully requested.

Review and reconsideration on the merits are requested.

In response to the Examiner's comment in paragraph 8 at page 3 of the Office Action, Applicants choose not to perfect the claim to priority (by filing an English translation of the priority document) at this time.

Claims 1-4 and 7 were rejected under 35 U.S.C. § 102(b) as being anticipated by JP '376. JP '376 was cited as disclosing a spark plug meeting each of the terms of the rejected claims, including an igniter made of a precious metal alloy and having a sum of nitrogen and oxygen gas content of 100 ppm or less formed on either the ground or center electrode. The precious metal alloy is said to have a composition with the scope of the rejected claims, including a Pt-Ni alloy containing Ni in an amount of 20 wt%.

Applicants respectfully traverse for the following reasons.

The Abstract of JP '376 describes an igniter prepared by fusing an electrode base material 11 and a noble metal material 18 to form a fused solid noble metal alloy layer 19 on the ignition section 12. Furthermore, a noble metal alloy electrode 13 made of Pt-Ir-Ni alloy is provided on the ignition section 12. Both the base material and noble metal disk 18 are manufactured to have a low oxygen content. The Abstract of JP '376 describes that by reducing the residual quantity of nitrogen and oxygen gas in the fused solid noble metal alloy layer 19, the occurrence of cracks

is suppressed and this in turn prevents peeling or dropping of the noble metal alloy electrode from the electrode base material.

More particularly, in JP '376, the chip (referred to as "noble metal material 18" is "completely fused." This feature of JP '376 is described in the English Abstract of the European Patent Office (copy attached) at lines 6-9 under "CONSTITUTION" as follows.

The ignition section 12 of the electrode base material 11 and the noble metal material 18 are heated and fused by laser welding to form a fused solid noble metal alloy layer 19 on the ignition section 12, and a noble metal alloy electrode 13 made of a Pt-Ir-Ni alloy is provided on the ignition section 12.

The spark plug of the present invention differs from that of JP '376 in that at least a portion of the igniter facing the spark discharge gap is free from a material of at least one of the center electrode and the ground electrode. This language clearly defines over the spark plug of JP '376 where the igniter consists of a fused solid noble metal alloy layer 19 and top electrode 13 made of a Pt-Ir-Ni alloy. That is, although the noble metal alloy layer 19 of JP '376 may have a reduced oxygen concentration, layer 19 is a fused metal alloy layer different from the igniter of the present invention which is not influenced by a compositional change and which is not alloyed with at least one of the center electrode and the ground electrode.

For the above reasons, it is respectfully submitted that claims 1-4 and 7 are not anticipated by JP '376, and withdrawal of the foregoing rejection under 35 U.S.C. § 102(b) is respectfully requested.

Claims 5-6 and 8-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '376 in view of U.S. Patent 6,215,234 to Abe et al. Abe et al was cited as disclosing the combination of a spark discharge gap within a range of 0.2 to 0.4 mm and a noble metal chip

(igniter) having crystal grains with an average axial diameter N that is not less than 50  $\mu\text{m}$ . The reason for rejection was that it would have been obvious to modify the spark plug of JP '376 to have a spark discharge gap and igniter having a crystal grain mean diameter of 50  $\mu\text{m}$  or more (as taught by Abe et al) to obtain an efficient and long-lived spark plug.

Applicants respectfully traverse for the following reasons.

Abe et al discloses a spark plug having a spark discharge gap within the claimed range and which also employs a noble metal chip as an igniter. As noted by the Examiner, the expression:

$$(N+K)/2 \leq 50\mu\text{m}$$

where  $N > K$  suggests that N, the mean axial diameter of the crystal grain size, is more than 50  $\mu\text{m}$ .

However, present claim 8 requires a crystal grain of more than 50  $\mu\text{m}$  in mean diameter different from the axial diameter N cited by the Examiner. As noted by the Examiner, Abe et al at column 9, line 18-20 describes that the noble metal chips were formed to have grains with an average diameter of 50  $\mu\text{m}$ . However, as described at column 9, lines 5-7, Abe et al further teaches that if the value of  $(N+K)/2$  exceeds 50  $\mu\text{m}$ , cracks produced in the noble metal chip can easily progress therein. That is, Abe et al teaches away from a mean crystal grain diameter of more than 50  $\mu\text{m}$ :

Incidentally, if the value of  $(N+K)/2$  of the noble metal chip 6 exceeds 50  $\mu\text{m}$ , a crack produced in the noble metal chip 6 can easily progress therein.

To distinguish over Abe et al, claim 8 has been amended to recite a crystal grain of more than 50  $\mu\text{m}$  in mean diameter. As discussed at page 5, lines 7-8 of the specification, such

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dimension is effective for preventing the peeling and sweating of the igniter. Abe et al clearly teaches away from the claimed crystal grain of more than 50  $\mu\text{m}$ .

With respect to the rejection of claims 5 and 6, Applicants rely on the response above with respect to the rejection of claim 1 over JP '376 alone. As discussed above, layer 19 of JP '376 is a fused metal alloy layer different from the igniter of the present invention which is not influenced by a compositional change and which is not alloyed with at least one of the center electrode and the ground electrode.

Withdrawal of the foregoing rejection under 35 U.S.C. § 103(a) is respectfully requested.

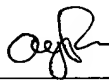
Withdrawal of all rejections and allowance of claims 1-15 and 20-26 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

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Respectfully submitted,



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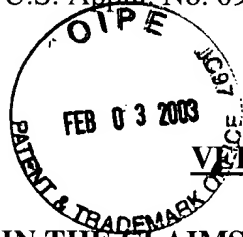
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Date: February 3, 2003



**APPENDIX**

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS:**

**Claims 16-19 are canceled.**

**The claims are amended as follows:**

1. (Amended) A spark plug comprising:

a center electrode;

a ground electrode opposing the center electrode in such a manner as to define a spark discharge gap between the center electrode and the ground electrode; and

an igniter fixed to at least one of the center electrode and the ground electrode in such a manner as to face the spark discharge gap, the igniter being composed of a metallic material whose principal component is one of a platinum and an iridium, the metallic material of the igniter comprising an oxygen content of not more than 120 ppm, wherein at least a portion of the igniter facing the spark discharge gap is free from a material of the at least one of the center electrode and the ground electrode.

8. (Amended) A spark plug comprising:

a center electrode;

a ground electrode opposing the center electrode in such a manner as to define a spark discharge gap between the center electrode and the ground electrode; and

an igniter fixed to at least one of the center electrode and the ground electrode in such a manner as to face the spark discharge gap, the igniter being composed of a metallic material

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whose principal component is one of a platinum and an iridium, the metallic material of the igniter comprising a crystal grain of [not less] more than 50  $\mu\text{m}$  in a mean diameter, and comprising an oxygen content of not more than 300 ppm, wherein at least a portion of the igniter facing the spark discharge gap is free from a material of at least one of the center electrode and the ground electrode.

**Claims 21-26 are added as new claims.**